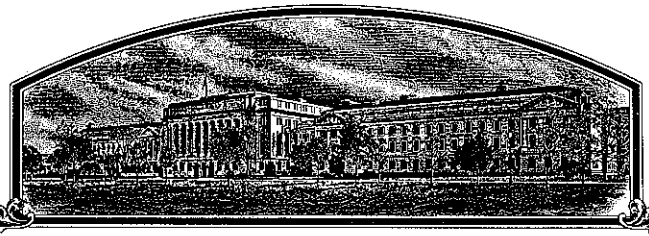

No. 9100211

THE UNITED STATES OF AMERICA

TO ALL TO WHOM THESE PRESENTS SHALL COME:

Texas Agricultural Experiment Station

Whereas, THERE HAS BEEN PRESENTED TO THE

Secretary of Agriculture

AN APPLICATION REQUESTING A CERTIFICATE OF PROTECTION FOR AN ALLEGED NOVEL VARIETY OF SEXUALLY REPRODUCED PLANT, THE NAME AND DESCRIPTION OF WHICH ARE CONTAINED IN THE APPLICATION AND EXHIBITS, A COPY OF WHICH IS HEREUNTO ANNEXED AND MADE A PART HEREOF, AND THE VARIOUS REQUIREMENTS OF LAW IN SUCH CASES MADE AND PROVIDED HAVE BEEN COMPLIED WITH, AND THE TITLE THERETO IS, FROM THE RECORDS OF THE PLANT VARIETY PROTECTION OFFICE, IN THE APPLICANT(S) INDICATED IN THE SAID COPY, AND WHEREAS, UPON DUE EXAMINATION MADE, THE SAID APPLICANT(S) IS (ARE) ADJUDGED TO BE ENTITLED TO A CERTIFICATE OF PLANT VARIETY PROTECTION UNDER THE LAW.

NOW, THEREFORE, THIS CERTIFICATE OF PLANT VARIETY PROTECTION IS TO GRANT UNTO THE SAID APPLICANT(S) AND THE SUCCESSORS, HEIRS OR ASSIGNS OF THE SAID APPLICANT(S) FOR THE TERM OF eighteen YEARS FROM THE DATE OF THIS GRANT, SUBJECT TO THE PAYMENT OF THE REQUIRED FEES AND PERIODIC REPLENISHMENT OF VIABLE BASIC SEED OF THE VARIETY IN A PUBLIC REPOSITORY AS PROVIDED BY LAW, THE RIGHT TO EXCLUDE OTHERS FROM SELLING THE VARIETY, OR OFFERING IT FOR SALE, OR REPRODUCING IT, IMPORTING IT, OR EXPORTING IT, OR USING IT IN PRODUCING A HYBRID OR DIFFERENT TY THEREFROM, TO THE EXTENT PROVIDED BY THE PLANT VARIETY PROTECTION ACT. UNITED STATES SEED OF THIS VARIETY (1) SHALL BE SOLD BY VARIETY NAME ONLY AS OF CERTIFIED SEED AND (2) SHALL CONFORM TO THE NUMBER OF GENERATIONS Y THE OWNER OF THE RIGHTS. (84 STAT. 1542, AS AMENDED, 7 U.S.C. 2321 ET SEQ.)

WHEAT

'TAM 109'

In Testimony Whereof, *I have hereunto set my hand and caused the seal of the* Plant Variety Protection Office *to be affixed at the City of* Washington, D.C. *this* 29th *day of* April *in the year of our Lord one thousand nine hundred and* ninety-four.

Attest:

Kenneth Evans
Commissioner
Plant Variety Protection Office
Agricultural Marketing Service

Secretary of Agriculture

FORM APPROVED: OMB 0581-0055, Expires 1/31/91

U.S. DEPARTMENT OF AGRICULTURE
AGRICULTURAL MARKETING SERVICE

APPLICATION FOR PLANT VARIETY PROTECTION CERTIFICATE

(Instructions on reverse)

Application is required in order to determine if a plant variety protection certificate is to be issued (7 U.S.C. 2421). Information is held confidential until certificate is issued (7 U.S.C. 2426).

1. NAME OF APPLICANT(S) *(as it is to appear on the Certificate)*
Texas Agricultural Experiment Station

2. TEMPORARY DESIGNATION OR EXPERIMENTAL NO.

3. VARIETY NAME
TAM 109

4. ADDRESS *(street and no. or R.F.D. no., city, state, and ZIP)*
College Station, TX 77843

5. PHONE *(Include area code)*
409/845-4051

FOR OFFICIAL USE ONLY

PVPO NUMBER 9100211

FILING Date: July 12, 1991 Time: ☐ A.M. ☐ P.M.

FEES RECEIVED Filing and Examination Fee: $2150.00 Date: July 8, 1991 Certificate Fee: $250.00 Date: April 5, 1994

6. GENUS AND SPECIES NAME
Triticum aestivum L. Thell

7. FAMILY NAME *(Botanical)*
gramineae

8. CROP KIND NAME *(Common Name)*
wheat

9. DATE OF DETERMINATION
June 30, 1986

10. IF THE APPLICANT NAMED IS NOT A "PERSON," GIVE FORM OF ORGANIZATION *(Corporation, partnership, association, etc.)*
official Public Agricultural Research Agency of the State of Texas

11. IF INCORPORATED, GIVE STATE OF INCORPORATION

12. DATE OF INCORPORATION

13. NAME AND ADDRESS OF APPLICANT REPRESENTATIVE(S), IF ANY, TO SERVE IN THIS APPLICATION AND RECEIVE ALL PAPERS
~~Dr. Paul G. Sebesta~~ Robert C. DOSE Technology Licensing Office, the Texas
~~Texas Foundation Seed~~ A&M University System 310 Wisenbaker
~~Texas Agricultural Experiment Station~~
College Station, TX 77843-~~2581~~ 3369
AAA 25 Apr 1994
PHONE *(Include area code)*: 409/845-~~4051~~ 1402 TAX 7-8682 845

14. CHECK APPROPRIATE BOX FOR EACH ATTACHMENT SUBMITTED *(Follow INSTRUCTIONS on reverse)*

a. ☒ Exhibit A, Origin and Breeding History of the Variety.
b. ☒ Exhibit B, Novelty Statement.
c. ☒ Exhibit C, Objective Description of Variety.
d. ☐ Exhibit D, Additional Description of Variety.
e. ☒ Exhibit E, Statement of the Basis of Applicant's Ownership.
f. ☒ Seed Sample (2,500 viable untreated seeds). Date Seed Sample mailed to Plant Variety Protection Office July 9, 1991
g. ☒ Filing and Examination Fee ($2,150) made payable to "Treasurer of the United States."

15. DOES THE APPLICANT(S) SPECIFY THAT SEED OF THIS VARIETY BE SOLD BY VARIETY NAME ONLY AS A CLASS OF CERTIFIED SEED? *(See section 83(a) of the Plant Variety Protection Act.)*
☒ YES *(If "YES," answer items 16 and 17 below)* ☐ NO *(If "NO," skip to item 18 below)*

16. DOES THE APPLICANT(S) SPECIFY THAT THIS VARIETY BE LIMITED AS TO NUMBER OF GENERATIONS?
☒ YES ☐ NO

17. IF "YES" TO ITEM 16, WHICH CLASSES OF PRODUCTION BEYOND BREEDER SEED?
☒ FOUNDATION ☐ REGISTERED ☒ CERTIFIED

18. DID THE APPLICANT(S) PREVIOUSLY FILE FOR PROTECTION OF THE VARIETY IN THE U.S.?
☐ YES *(If "YES," through* ☐ Plant Variety Protection Act ☐ Patent Act. Give date: _____.)
☒ NO

19. HAS THE VARIETY BEEN RELEASED, USED, OFFERED FOR SALE, OR MARKETED IN THE U.S. OR OTHER COUNTRIES?
☐ YES (If "YES," give names of countries and dates)
☒ NO

20. The applicant(s) declare(s) that a viable sample of basic seeds of this variety will be furnished with the application and will be replenished upon request in accordance with such regulations as may be applicable.

The undersigned applicant(s) is (are) the owner(s) of this sexually reproduced novel plant variety, and believe(s) that the variety is distinct, uniform, and stable as required in section 41, and is entitled to protection under the provisions of section 42 of the Plant Variety Protection Act.

Applicant(s) is (are) informed that false representation herein can jeopardize protection and result in penalties.

SIGNATURE OF APPLICANT *(Owner(s))*	CAPACITY OR TITLE	DATE
Paul G. Sebesta	Director, Texas Foundation Seed	7-5-91
SIGNATURE OF APPLICANT *(Owner(s))*	CAPACITY OR TITLE	DATE
		1

Exhibit A. **Origin and Breeding History of the Variety**

TX87A6821 is a semidwarf hard red winter wheat developed by the Texas Agricultural Experiment Station. TX87A6821 was selected from the cross TAM W-101*5/CI9321 made by Dr. K.B. Porter at the Texas Agricultural Experiment Station at Bushland, TX in 1976. CI9321 was an awnletted spring wheat which was being utilized in a research program to analyze the effectiveness of pubescence for greenbug resistance. In 1986, 50 awnletted BC5F3 headrows were grown in the field at Bushland. Each of these rows was harvested and the resulting seed was grown in unreplicated plots in a dryland observation nursery at Bushland in 1987. TX87A6821 was derived from one of these single plots which showed no segregation for awned and awnletted plants. Beginning in 1988, TX87A6821 was included in performance tests; in Bushland in 1988 and in uniform performance tests on the High Plains and Rolling Plains in 1989. In 1990, TX87A6821 was entered in uniform trials grown throughout Texas.

PERFORMANCE

Mean yield of TX87A6821 is compared to mean yields of TAM W-101 and TAM-200 in Table 1. In 1988, TX87A6821 was grown in the Advanced III performance test planted in irrigated and rainfed trials. Under irrigation, TX87A6821 yielded 0.8 bu/a less than TAM W-101 but was not significantly lower yielding (LSD.05=7.4). In the rainfed trial, TX87A6821 yielded 42.7 bu/a, 8.9 bu/a higher than TAM W-101 but not significantly higher yielding statistically (LSD.05=9.2). Average yield for the 2 tests was 53.0 bu/a and 49.0 bu/a for TX87A6821 and TAM W-101, respectively.

A late freeze in April followed by hail prevented the harvest of all but one of the performance tests planted on the High Plains in 1989. TX87A6821 was included that year in the Wheat Elite Nursery planted as a rainfed test on a farmers field near Washburn, TX. TX87A6821 yielded 9.4 bu/a and TAM W-101 yielded 7.1 bu/a. The LSD.05 for this test was 2.4 so yields of the varieties were not statistically separable. TAM-200 was significantly

higher yielding than either TX87A6821 or TAM W-101. Only 2 yield tests were harvested in the Rolling Plains in 1989. TX87A6821 and TAM W-101 yielded nearly identically in both tests. Averaged over the 2 locations, TX87A6821 and TAM W-101 yielded 29.4 and 29.1, respectively.

In 1990, TX87A6821 was again entered in the Uniform Wheat Elite Nursery planted in all major agroclimatic zones in Texas. Results of the harvested locations in the 1990 Uniform Elite appear in Table 1. Statewide, TX87A6821 yielded similarly to TAM W-101. Its average yield was higher than TAM W-101 in Overton, in northcentral Texas and on the High Plains and was slightly lower than TAM W-101 in Rolling Plains tests. Statewide average yield of TX87A6821 was only 2.7 bu/a lower than the average of the highest yielding variety in the test.

DISEASE REACTION

In 1990, leaf rust was a yield-limiting factor in performance tests at the TAES Center at Dallas and powdery mildew effected yields in research trials at Prosper. The disease reaction of TX87A6821 was very similar to TAM W-101 at both locations. TX87A6821 is susceptible to the races of leaf rust and powdery mildew currently prevalent in Texas. Its leaf rust severity of 86.7 was significantly higher than that of Collin, a hard red winter wheat released specifically for the Blacklands/Cross Timbers. The percent infection by leaf rust on TX87A6821 was not significantly higher than that of TAM-200, however, TAM-200 had a moderately susceptible reaction whereas the reaction of TX87A6821 was fully susceptible. Leaf rust reactions of TX87A6821 and TAM W-101 were similar in Rolling Plains tests in 1990 although the severity of leaf rust was slightly higher on TX87A6821 at Chillicothe than it was on TAM W-101. In nurseries in Overton in 1990, leaf rust on TX87A6821 was rated 1 (0-9 scale) which was slightly better than TAM W-101 which was given a rating of 2. Both TX87A6821 and TAM W-101 had ratings of 4 for Septoria nodorum at Overton which were less susceptible than the average of the test.

AGRONOMIC CHARACTERISTICS

Agronomic characteristics of TX87A6821 have been very similar to those of TAM W-101. The only notable differences have been lodging and winter injury. In 1989, significant winter injury was observed on many genotypes due to a late season freeze. Ratings for TX87A6821 and TAM W-101 were 2.3 and 1.3, respectively (0-5 scale: 0=no damage). While this may be slightly higher than expected, the rating in the same nursery for TAM-200 was 2.2. Observations in nursery plots in 1991, also a year with significant winter injury on susceptible genotypes, indicate that TX87A6821 is identical to TAM W-101 in cold tolerance. Susceptibility to lodging often is identified in high yielding irrigated nurseries at Bushland. In 1990, lodging for TAM-200, TX87A6821 and TAM W-101 was 0%, 2% and 30%, respectively, indicating that TX87A6821 may have less propensity to lodge than TAM W-101. Individual location data for days to 50% heading and plant height are presented in Table 2. TX87A6821 was 1 day later heading and 1 cm shorter than TAM W-101 over 3 years of tests on the High Plains. Over 2 years of tests in the Rolling Plains, it headed an average of 3 days later than TAM W-101 and was 2 cm shorter. Considering all test locations in Texas from 1988 through 1990, TX87A6821 headed 1 day later than TAM W-101 and was 1 cm shorter. TX87A6821 averages slightly less than 1 week later in heading than TAM-200 and is approximately the same height as TAM-200.

Average test weight of TX87A6821 has been slightly lower than that of TAM W-101. This difference may be a function of disease susceptibility since its test weight has been nearly identical to TAM W-101 on the High Plains where diseases associated with lower test weights were absent. Nevertheless, the difference in average test weight of TX87A6821 compared to TAM W-101 does not appear sufficient to warrant concern.

MILLING AND BAKING QUALITY

Grain samples of TX87A6821 were submitted to the Cereal Quality Laboratory at College Station for analysis of end-use characteristics in 1989 and 1990 (Table 3). In 1989, grain protein, flour protein, ash and water absorption were slightly lower for TX87A6821

than TAM W-101. Although the difference in grain protein between TX87A6821 and TAM W-101 was 1.9%, this only translated into a difference of 0.4% flour protein. Mixing time of TX87A6821 was slightly longer than TAM W-101 but equal to TAM-200. The subjective evaluation of the mixograph for both TX87A6821 and TAM W-101 was "fair." Baking data from 1989 indicated that TX87A6821 produced slightly better bread than TAM W-101. Bake water absorption, loaf volume and volume score all were higher for TX87A6821 than TAM W-101. Bake mixing time was identical to TAM W-101 while proof height, and bread height were slightly lower. Crumb texture for both TX87A6821 and TAM W-101 was judged fair to good.

Milling and baking analyses of grain composites from the 1990 harvest largely confirmed 1989 tests. Whole wheat and flour protein of TX87A6821 were slightly lower than TAM W-101. Mixograph mix time was one-and-one-half minutes longer than TAM W-101. Both mixographs were judged questionable to fair. Bake water absorption of TX87A6821 was 1% lower than TAM W-101 and bake mixing time was 1 minute shorter. Proof height, loaf height and loaf volume of TX87A6821 all were slightly higher than TAM W-101. Crumb texture of TX87A6821 was rated good compared to TAM W-101 which was rated fair. Results of micromilling and mixograph analyses of samples from individual locations growing the 1990 Uniform Wheat Elite as presented in Table 4. For the 5 characteristics measured, TX87A6821 was slightly lower than TAM W-101, although the differences were negligible. The only significant difference between the two genotypes is the longer mixing time of TX87A6821. While the average mixing time of TX87A6821 was 1:15 longer than TAM W-101, it is still well within the range of acceptability and may, in fact, provide a positive alternative for millers who need genotypes to blend with short-mixing flours.

TX87A6821 has been entered in the Wheat Quality Council's 1991 large scale mill and bake test which will be evaluated in February of 1992.

JUSTIFICATION FOR RELEASE

For many years, Texas wheat producers have asked that TAES make available an awnless hard red winter wheat. Release of an awnless hard wheat will assist producers in diversification programs since an awnless wheat may be utilized as a source of fall, winter and early spring forage, cut for hay or harvested for grain. While awned wheats may facilitate similar diversification, the presence of awns is perceived as a quality-limiting factor for hay and graze-out programs. Data to substantiate this perception are not readily available, however, data have been collected to indicate that awned wheats in graze-out production systems are an eye irritant to cattle which lead to increased incidence of pink-eye and other eye disorders. Producers who wish to grow awnless wheat currently depend upon awnless soft red winter wheats which has proven detrimental to marketing systems in Texas. TX87A6821 does not produce grain yield competitively with other new releases from TAES, however, it is competitive with its recurrent parent, TAM W-101, which is still widely grown in Texas and Oklahoma. Analysis of early season forage production at Overton in 1990-91 indicate that it is competitive with other hard red winter wheats. Due to its reaction to leaf rust, it will be recommended for production in the western Rolling Plains and on the High Plains.

RECOMMENDATION FOR NAME

Following suggestions adopted by the TAES small grains workers at their annual meeting in Dallas in 1988, it is recommended that TX87A6821 be named TAM-109. If approved, it will follow TAM-108 in the series of hard red winter wheats developed primarily by Dr. K.B. Porter for production on the High Plains of Texas.

Exhibit B. **Novelty Statement for TAM-109**

TAM-109 is the result of a directed cross between an awnletted spring wheat, CI9321, and an awned hard red winter wheat, TAM W-101, Following the initial cross, four backcrosses were made to the recurrent parent, TAM W-101. TAM-109 is unique since it is similar to TAM W-101 for all measured characteristics except that is distinguishable from TAM W-101 since it lacks awns. It is novel among hard red winter wheats adapted to the southern Great Plains due to its phenotypic similarity to TAM W-101 and lack of awns.

9100211

TEXAS AGRICULTURAL EXPERIMENT STATION
AGRICULTURAL RESEARCH AND EXTENSION CENTER
Vernon

May 24, 1993

Dr. Paul Sebesta, Manager
Texas Foundation Seed Service
Texas A&M University
Mail Stop 2581
College Station, Texas 77843-2581

Dear Paul:

In response to the concerns expressed by the Plant Variety Protection Office in the letter of A. A. Atchley to you dated December 10, 1992, please advise the following:

A. TAM-109 is the result of five backcrosses to TAM W-101. Because of this, it is nearly isogenic to TAM W-101. It has been observed to be stable and uniform in all test and production situations at multiple locations and in several states since 1987.

B. TAM-109 is most similar to TAM W-101. TAM W-101 is an awned cultivar whereas TAM-109 is an awnletted cultivar. The difference between awned and awnletted is striking and needs no statistical analysis for confirmation.

Thanks for reminding me I was so far past your submission deadline. Sorry.

Sincerely,

W. David Worrall/mss

W. David Worrall
Small Grains Breeder

WDW:mss

THE TEXAS A&M UNIVERSITY SYSTEM
P.O. Box 1658
11708 Highway 70 South
Vernon, Texas 76385
(817) 552-9941 FAX (817) 553-4657

8

Table 1. Yield (bu/a) and test weight (lb/bu) of TX87A6821, TAM W-101 and TAM-200 in Texas uniform performance tests between 1988 and 1990.

	TX87A6821		TAM W-101		TAM-200	
	Yield	Test Wt	Yield	Test Wt	Yield	Test Wt
HIGH PLAINS:						
1988: Bushland (Irrigated)	63.3	52.2	64.1	53.7		
Bushland (Rainfed)	42.7	59.9	33.8	59.0		
1988 Mean	53.0	56.1	49.0	56.4		
1989: Washburn	9.4	56.3	7.1	56.3	13.7	59.9
1990: Bushland (Irrigated)	97.8	62.2	98.1	62.6	115.8	64.5
Bushland (Rainfed)	18.1	56.3	17.8	57.2	20.2	58.0
Washburn	35.4	62.2	28.8	62.2	36.2	64.8
Stinnett	18.9	58.4	15.5	58.8	28.7	62.1
1990 Mean	42.6	59.8	40.1	60.2	50.2	62.4
3-Year Mean	40.8	58.2	37.9	58.5		
ROLLING PLAINS:						
1989: Chillicothe	35.0	58.7	35.0	59.3	39.5	59.8
Tolbert	23.7	58.8	23.2	57.7	22.3	60.6
1989 Mean	29.4	58.8	29.1	58.5	30.9	60.2
1990: Chillicothe	55.2	59.3	56.2	61.2	73.7	61.6
Lockett	39.0	56.6	54.4	59.1	68.8	59.0
Olney	37.2	55.5	49.4	59.9	54.0	59.1
1990 Mean	43.8	57.1	53.3	60.1	65.5	59.9
2-Year Mean	38.0	57.8	43.6	59.4	51.7	60.0
CENTRAL & EAST TEXAS :						
1990: Dallas	19.2	50.2	23.5	53.1	35.5	56.6
Prosper	25.3	54.4	19.4	56.4	30.0	55.6
Temple	30.7	54.3	35.9	58.2	47.7	59.5
1990 Mean	25.1	53.0	26.3	55.9	37.7	57.2
Overall Mean	36.7	57.0	37.5	58.3		

Table 2. Julian days to 50% heading and plant height (cm) of TX87A6821, TAM W-101 and research test grown in 1988, 1989 and 1990.

	TX87A6821		TAM W-101		TAM-200	
	Heading	Height	Heading	Height	Heading	Height
HIGH PLAINS:						
1988: Bushland (Irrigated)	130	75	130	83		
Bushland (Rainfed)	130	63	129	60		
1988 Mean	130	69	130	72		
1989: Washburn		35		35		33
1990: Bushland (Irrigated)	132	85	131	83	129	85
Bushland (Rainfed)	139	55	138	55	136	55
Washburn		63		60		65
Stinnett		53		55		53
1990 Mean	136	64	135	63	133	65
3-Year Regional Mean	133	61	132	62		
ROLLING PLAINS:						
1989: Chillicothe	116	50	117	51	116	46
Tolbert		37		45		37
1989 Mean	—	44	—	48	—	42
1990: Chillicothe	125	86	118	86	116	79
Lockett	115	85	114	87	106	78
Tolbert		73		77		68
Olney		91		85		86
1990 Mean	120	84	116	84	111	78
2-Year Mean	119	70	116	72	113	66
CENTRAL AND EAST TEXAS:						
1990: Dallas	115	78	113	83	101	78
Prosper	117		119		103	
Temple		78		75		78
1990 Mean	116	78	116	79	102	78
Overall Mean	125	67	124	68		

Table 3. Mixograph and baking results for TX87A6821 and TAM W-101 for grain harvest in 1989 and 1990.

	TX87A6821		TAM W-101	
	1989	1990[1/]	1989	1990
Milling and Mixograph Results:				
Wheat Protein (%)	14.1	11.3	16.0	12.4
Flour Protein (%)	12.7	10.3	13.1	11.3
Ash (%)	0.34	0.34	0.36	0.35
Water Absorption (%)	62.7	60.3	63.1	61.3
Mixograph Mix Time (min:sec)	4:00	6:00	3:30	4:30
Baking Results:				
Water Absorption (%)	63.0	59.2	61.5	60.2
Mixing Time (min:sec)	3:15	3:00	3:15	4:00
Proof Height (cm)	7.5	7.4	7.6	7.3
Loaf Volume (cc)	930	875	910	845
Bread Height (cm)	11.0	10.9	11.3	10.6
Volume Score[2/]	64.9	78.8	60.4	65.7

1/ Results of a 5-location grain composite.
2/ (Loaf Volume-300)/(Flour Protein-3).

11

Table 2. Julian days to 50% heading and plant height (cm) of TX87A6821, TAM W-101 and TAM-200 from uniform research test grown in 1988, 1989 and 1990.

		TX87A6821		TAM W-101		TAM-200	
		Heading	Height	Heading	Height	Heading	Height
HIGH PLAINS:							
1988:	Bushland (Irrigated)	130	75	130	83		
	Bushland (Rainfed)	130	63	129	60		
	1988 Mean	130	69	130	72		
1989:	Washburn		35		35		33
1990:	Bushland (Irrigated)	132	85	131	83	129	85
	Bushland (Rainfed)	139	55	138	55	136	55
	Washburn		63		60		65
	Stinnett		53		55		53
	1990 Mean	136	64	135	63	133	65
	3-Year Regional Mean	133	61	132	62		
ROLLING PLAINS:							
1989:	Chillicothe	116	50	117	51	116	46
	Tolbert		37		45		37
	1989 Mean	—	44	—	48	—	42
1990:	Chillicothe	125	86	118	86	116	79
	Lockett	115	85	114	87	106	78
	Tolbert		73		77		68
	Olney		91		85		86
	1990 Mean	120	84	116	84	111	78
	2-Year Mean	119	70	116	72	113	66
CENTRAL AND EAST TEXAS:							
1990:	Dallas	115	78	113	83	101	78
	Prosper	117		119		103	
	Temple		78		75		78
	1990 Mean	116	78	116	79	102	78
	Overall Mean	125	67	124	68		

Table 3. Mixograph and baking results for TX87A6821 and TAM W-101 for grain harvested in 1989 and 1990.

	TX87A6821		TAM W-101	
	1989	1990[1/]	1989	1990
Milling and Mixograph Results:				
Wheat Protein (%)	14.1	11.3	16.0	12.4
Flour Protein (%)	12.7	10.3	13.1	11.3
Ash (%)	0.34	0.34	0.36	0.35
Water Absorption (%)	62.7	60.3	63.1	61.3
Mixograph Mix Time (min:sec)	4:00	6:00	3:30	4:30
Baking Results:				
Water Absorption (%)	63.0	59.2	61.5	60.2
Mixing Time (min:sec)	3:15	3:00	3:15	4:00
Proof Height (cm)	7.5	7.4	7.6	7.3
Loaf Volume (cc)	930	875	910	845
Bread Height (cm)	11.0	10.9	11.3	10.6
Volume Score[2/]	64.9	78.8	60.4	65.7

1/ Results of a 5-location grain composite.
2/ (Loaf Volume-300)/(Flour Protein-3).

Table 4. Results of micromilling grain samples from individual locations in the 1990 Uniform Wheat Elite Test.

Location	Milling Yield (%)		Flour Protein (%)		Water Absorption (%)		Mix Time (Min:Sec)		Mixograph Rating	
	TX87A6821	TAM W-101	TX87A6821	TAM W-101	TX87A6821	TAM W-101	TX87A6821	TAM W-101	TX87A6821	TAM W-101
Dallas	63.9	66.8	10.0	10.4	60.0	60.4	5:15	4:15	3.5	4.0
McGregor	69.3	70.6	9.9	10.0	59.9	60.0	4:30	4:00	2.5	3.5
Chillicothe	69.8	73.1	11.7	11.5	61.7	61.5	5:45	4:00	3.5	3.5
Bushland	74.4	75.3	NA	10.6	60.1	60.6	4:15	2:15	1.5	1.0
Washburn	70.6	69.9	10.3	11.8	60.3	61.8	5:30	4:15	3.5	3.0
Average	69.6	71.1	10.4	10.9	60.4	60.9	5:00	3:45	2.9	3.0

FORM APPROVED: OMB NO. 0581-0055

U.S. DEPARTMENT OF AGRICULTURE
AGRICULTURAL MARKETING SERVICE
LIVESTOCK AND SEED DIVISION
BELTSVILLE, MARYLAND 20705

EXHIBIT C
(Wheat)

OBJECTIVE DESCRIPTION OF VARIETY
WHEAT (*TRITICUM SPP.*)

INSTRUCTIONS: *See Reverse.*

NAME OF APPLICANT(S)
W. David Worrall

ADDRESS (*Street and No. or R.F.D. No., City, State, and ZIP Code*)
Texas Agricultural Experiment Station
PO Box 1658
Vernon, TX 76384

FOR OFFICIAL USE ONLY
PVPO NUMBER 9100211

VARIETY NAME OR TEMPORARY DESIGNATION
Variety Name = TAM 109

Place the appropriate number that describes the varietal character of this variety in the boxes below.
Place a zero in first box (e.g. [0][8][9] or [0][9]) when number is either 99 or less or 9 or less.

1. KIND:

[1] 1 = COMMON 2 = DURUM 3 = EMMER 4 = SPELT 5 = POLISH 6 = POULARD 7 = CLUB

2. TYPE:

[2] 1 = SPRING 2 = WINTER 3 = OTHER (*Specify*) _____ [2] 1 = SOFT 2 = HARD 3 = OTHER (*Specify*) _____

[2] 1 = WHITE 2 = RED 3 = OTHER (*Specify*) _____

3. SEASON - NUMBER OF DAYS FROM EMERGENCE TO:

[ ][ ][ ] FIRST FLOWERING Not measured [ ][ ][ ] LAST FLOWERING

4. MATURITY (*50% Flowering*):

[–][–] NO. OF DAYS *EARLIER* THAN ..... [ ] 1 = ARTHUR 2 = SCOUT 3 = CHRIS

[0][1] NO. OF DAYS *LATER* THAN ... TAM W-101 ..... [ ] 4 = LEMHI 5 = NUGAINES 6 = LEEDS

5. PLANT HEIGHT (*From soil level to top of head*):

[0][6][5] CM. HIGH

[–][–] CM. TALLER THAN ..... [–]

[0][8] CM. SHORTER THAN ..... [2] 1 = ARTHUR 2 = SCOUT 3 = CHRIS 4 = LEMHI 5 = NUGAINES 6 = LEEDS

6. PLANT COLOR AT BOOTING (*See reverse*):

[2] 1 = YELLOW GREEN 2 = GREEN 3 = BLUE GREEN

7. ANTHER COLOR:

[1] 1 = YELLOW 2 = PURPLE

8. STEM:

[1] Anthocyanin: 1 = ABSENT 2 = PRESENT

[1] Waxy bloom: 1 = ABSENT 2 = PRESENT

[1] Hairiness of last internode of rachis: 1 = ABSENT 2 = PRESENT

[1] Internodes: 1 = HOLLOW 2 = SOLID

[0][4] NO. OF NODES (*Originating from node above ground*)

[1][4] CM. INTERNODE LENGTH BETWEEN FLAG LEAF AND LEAF BELOW

9. AURICLES:

[1] Anthocyanin: 1 = ABSENT 2 = PRESENT

[1] Hairiness: 1 = ABSENT 2 = PRESENT

10. LEAF:

[1] Flag leaf at booting stage: 1 = ERECT 2 = RECURVED 3 = OTHER (*Specify*): _____

[1] Flag leaf: 1 = NOT TWISTED 2 = TWISTED

[1] Hairs of first leaf sheath: 1 = ABSENT 2 = PRESENT

[1] Waxy bloom of flag leaf sheath: 1 = ABSENT 2 = PRESENT

[1][1] MM. LEAF WIDTH (*First leaf below flag leaf*)

[1][6] CM. LEAF LENGTH (*First leaf below flag leaf*):

9100211

11. HEAD:

[2] Density: 1 = LAX 2 = DENSE

[1] Shape: 1 = TAPERING 2 = STRAP 3 = CLAVATE 4 = OTHER *(Specify)* _____

[3] Awnedness: 1 = AWNLESS 2 = APICALLY AWNLETED 3 = AWNLETED 4 = AWNED

[1] Color at maturity: 1 = WHITE 2 = YELLOW 3 = PINK 4 = RED 5 = BROWN 6 = BLACK 7 = OTHER *(Specify)*: _____

[0 8] CM. LENGTH [0 8] MM. WIDTH

12. GLUMES AT MATURITY:

[3] Length: 1 = SHORT *(CA. 7 mm.)* 2 = MEDIUM *(CA. 8 mm.)* 3 = LONG *(CA. 9 mm.)*

[–] Width: 1 = NARROW *(CA. 3 mm.)* 2 = MEDIUM *(CA. 3.5 mm.)* 3 = WIDE *(CA. 4 mm.)*

[3] Shoulder shape: 1 = WANTING 2 = OBLIQUE 3 = ROUNDED 4 = SQUARE 5 = ELEVATED 6 = APICULATE

[ ] Beak: 1 = OBTUSE 2 = ACUTE 3 = ACUMINATE

13. COLEOPTILE COLOR:

[1] 1 = WHITE 2 = RED 3 = PURPLE

14. SEEDLING ANTHOCYANIN:

[1] 1 = ABSENT 2 = PRESENT

15. JUVENILE PLANT GROWTH HABIT:

[2] 1 = PROSTRATE 2 = SEMI-ERECT 3 = ERECT

16. SEED:

[3] Shape: 1 = OVATE 2 = OVAL 3 = ELLIPTICAL

[1] Cheek: 1 = ROUNDED 2 = ANGULAR

[2] Brush: 1 = SHORT 2 = MEDIUM 3 = LONG

[1] Brush: 1 = NOT COLLARED 2 = COLLARED

[–] Phenol reaction *(See instructions)*: 1 = IVORY 2 = FAWN 3 = LT. BROWN 4 = BROWN 5 = BLACK

[3] Color: 1 = WHITE 2 = AMBER 3 = RED 4 = PURPLE 5 = OTHER *(Specify)*

[0 6] MM. LENGTH [0 3] MM. WIDTH [~~0 3~~] GM. PER 1000 SEEDS omitted from Labobase 13 Nov 1995

17. SEED CREASE:

[–] Width: 1 = 60% OR LESS OF KERNEL 'WINOKA' 2 = 80% OR LESS OF KERNEL 'CHRIS' 3 = NEARLY AS WIDE AS KERNEL 'LEMHI'

[ ] Depth: 1 = 20% OR LESS OF KERNEL 'SCOUT' 2 = 35% OR LESS OF KERNEL 'CHRIS' 3 = 50% OR LESS OF KERNEL 'LEMHI'

18. DISEASE: (0 = Not Tested, 1 = Susceptible, 2 = Resistant)

[1] STEM RUST *(Races)* _____ [1] LEAF RUST *(Races)* _____ [0] STRIPE RUST *(Races)* _____ [0] LOOSE SMUT

[1] POWDERY MILDEW [0] BUNT [ ] OTHER *(Specify)* _____

19. INSECT: (0 = Not Tested, 1 = Susceptible, 2 = Resistant)

[0] SAWFLY [ ] APHID *(Bydv.)* [1] GREEN BUG [0] CEREAL LEAF BEETLE

[ ] OTHER *(Specify)* _____ HESSIAN FLY RACES: [ ] GP [ ] A [ ] B [ ] C [ ] D [ ] E [ ] F [ ] G

20. INDICATE WHICH VARIETY MOST CLOSELY RESEMBLES THAT SUBMITTED:

CHARACTER	NAME OF VARIETY	CHARACTER	NAME OF VARIETY
Plant tillering	TAM W-101	Seed size	TAM W-101
Leaf size	TAM W-101	Seed shape	TAM W-101
Leaf color	TAM W-101	Coleoptile elongation	TAM W-101
Leaf carriage	TAM W-101	Seedling pigmentation	TAM W-101

INSTRUCTIONS

GENERAL: The following publications may be used as a reference aid for the standardization of terms and procedures for completing this form.

(a) L.W. Briggle and L. P. Reitz, 1963, Classification of Triticum Species and Wheat Varieties Grown in the United States, Technical Bulletin 1278, United States Department of Agriculture.

(b) W.E. Walls, 1965, A Standardized Phenol Method for Testing Wheat Seeds for Varietal Purity, contribution No. 28 to the handbook of seed testing prepared by the Association of Official Seed Analysts. *(See attachment.)*

LEAF COLOR: Nickerson's or any recognized color fan should be used to determine the leaf color of the described variety.

Exhibit E. **Statement of the Basis of Applicant's Ownership**

Ownership of TAM 109 by the Texas Agricultural Experiment Station (TAES) is based on the fact that unique selections were made at TAES facilities at Vernon, Texas. TAES personnel performed all selection and testing activities. Initial Breeder Seed production was made by TAES.